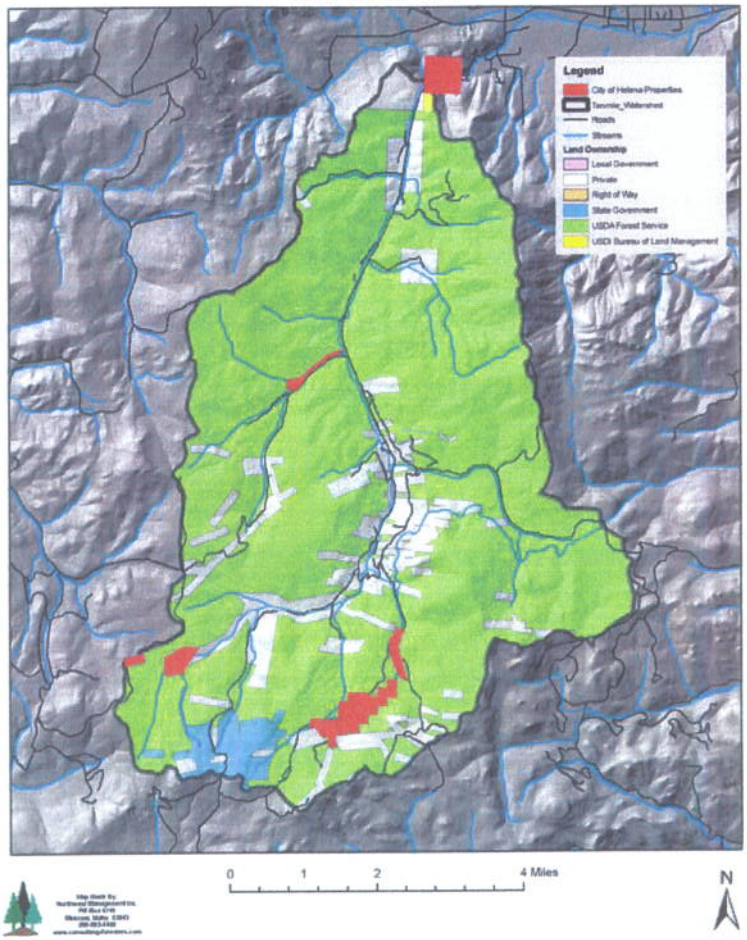
# Forest Land Assessment of the City of Helena Lands in the Upper Tenmile Creek Watershed

City of Helena
Upper Tenmile Creek Drainage

Land Ownership




**October 9, 2007**

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## Introduction

The City of Helena's Water Treatment Division is responsible for supplying the City of Helena with safe drinking water and maintaining all water plants, pumping stations, reservoirs, head gates, and other equipment necessary to maintain the water treatment system. The source for much of the City of Helena's municipal water is the Upper Tenmile Creek watershed. The City of Helena owns the first and second water rights on Tenmile Creek. The first water right is for 325 miners inches of water per day and the second is for 225 miners inches. This is approximately 8.9 million gallons of water per day that can be provided to residents of the City of Helena following treatment at the Tenmile Creek Water Treatment Plant. The treatment plant is located on the downstream end of the Upper Tenmile Creek watershed adjacent to Highway 12. More than 53,000 people in the Helena area are dependent on Tenmile Creek as a source for their water supply.

The Upper Tenmile Creek watershed, which is predominantly forested, lies south of US Highway 12, about seven miles west of Helena, Montana. The upper watershed is oriented south to north and extends about nine miles south to its headwaters from US Highway 12. The west boundary of the watershed is the Continental Divide, while the south boundary is the ridge which divides the Basin Creek drainage. The eastern divide of the upper watershed follows forested ridges near Colorado Mountain and Black Mountain. The watershed's most prominent landmark is Red Mountain, which lies in the southeast corner of the watershed and has a summit elevation of 8,150 feet above sea level. Total acreage of the Upper Tenmile Creek watershed is approximately 26,300 acres.

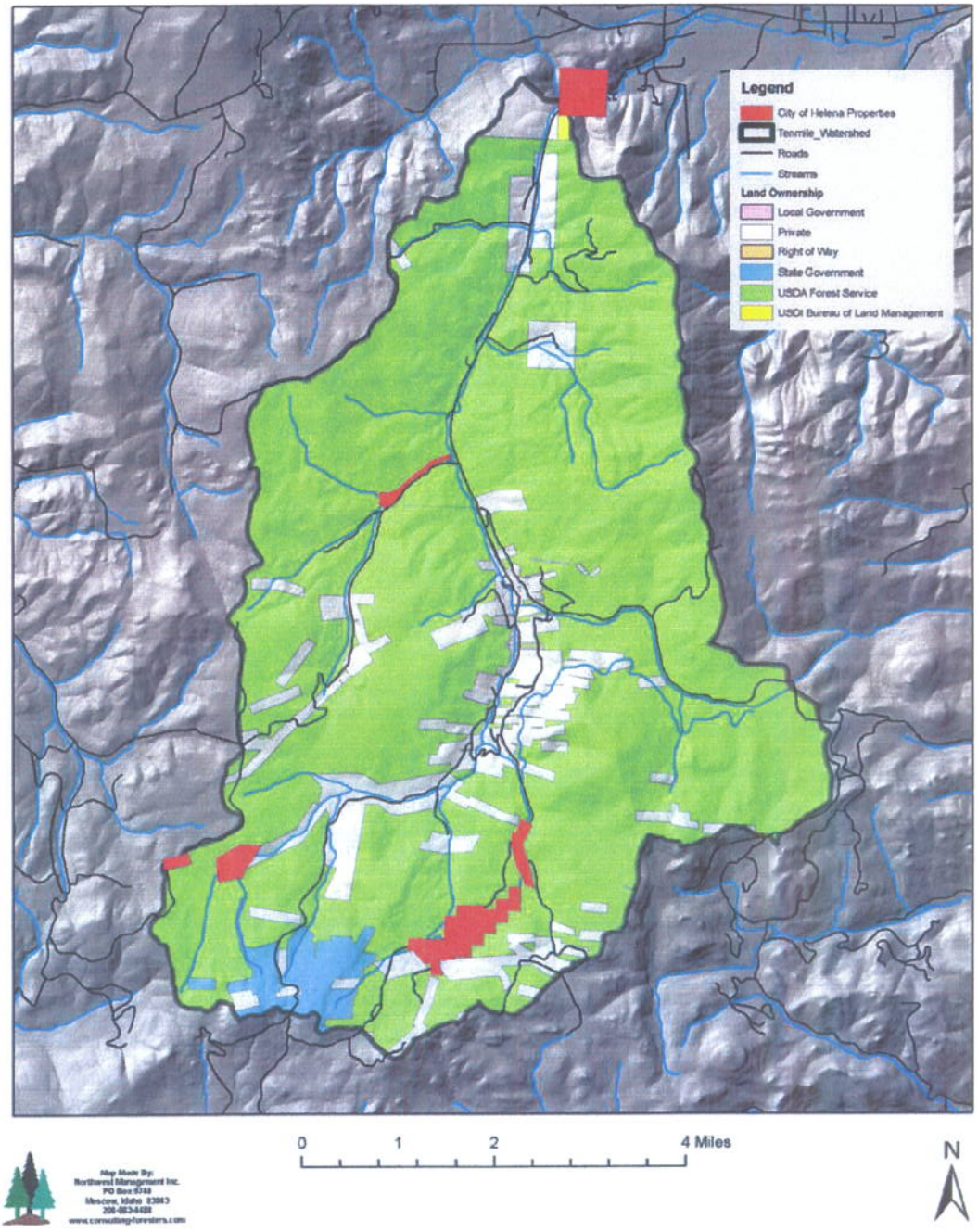
***Land Ownership in the Upper Tenmile Creek Watershed***

| Land Ownership in the Upper Tenmile Creek Watershed | |
|---|---|
| **Owner** | **Acres** |
| Local Government | 595 |
| Private Lands | 3,890 |
| Right-of-Way | 0.7 |
| State Government | 627.1 |
| USDA Forest Service | 21,166 |
| USDI Bureau of Land Management | 22.7 |

## *Map of Land Ownership of Upper Tenmile Creek Drainage*

City of Helena
Upper Tenmile Creek Drainage

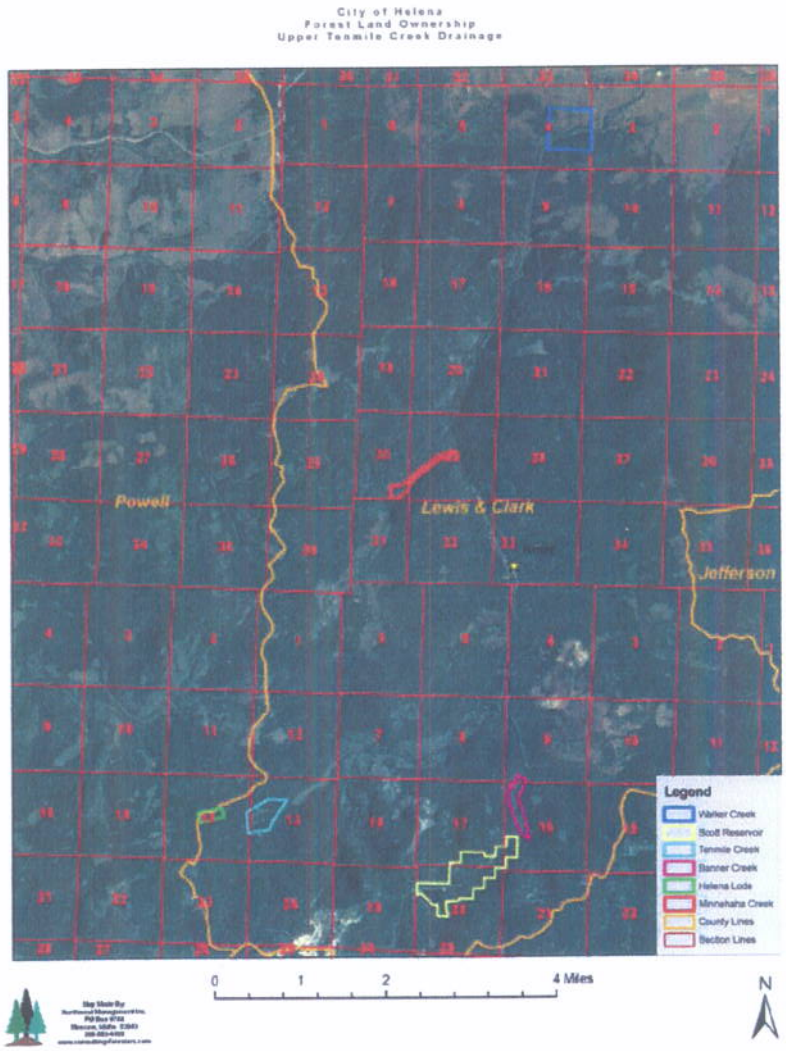
Land Ownership



For the purpose of this report, the following City of Helena lands were evaluated in regards to forest health.

| City of Helena Owned Forest Lands | | |
|---|---|---|
| **Location** | **Description** | **Acres** |
| Minnehaha Creek | Minnehaha Creek Lot 5589 Mineral Entry 3764 | 35.8 |
| Scott Reservoir | Bonanza (51.8 acres), Gould (30.5 acres), Muth Placer (60.7 acres), and Perseverance Placer (100 acres), Mineral Surveys 9526 & 8212 | 243.0 |
| Banner Creek | Banner Placer Survey 4764 | 53.2 |
| Tenmile Creek | Portion of Park Placer Survey 3044 | 82.4 |
| Helena Lode | Helena Lode Mineral Survey 7401 | 20.6 |
| Walker Creek | Walker Creek Homestead | 160.0 |

***Map of City of Helena Land Ownership in Upper Tenmile Creek Drainage***



## Purpose of Assessment

The Lewis and Clark County, Helena and East Helena Pre-Disaster Mitigation Plan, prepared and adopted by Lewis and Clark County on April 12, 2005, identified the municipal watershed in Upper Tenmile Creek as a concern because a large wildfire could potentially have a severe negative impact on the quality and quantity of Helena's water supply. Additionally, the Upper Ten Mile Creek Watershed Protection Group has adopted fuel hazard reduction as one of their goals.

The Regional Community Wildfire Protection Plan (RCWPP), prepared by the Tri-county Fire Working Group, in 2005, for Lewis and Clark County, also addresses the Tenmile Creek watershed. Wildland Fuel Hazard Rating Maps included within the RCWPP indicate that the Upper Tenmile Creek watershed includes Moderate, High and Very High Fuel Hazards. Dense conifer stands within the watershed represent a high fuel hazard (Group C) with potential for high intensity crown fires. High to severe fuel hazards (Group X) with potential for high intensity fire and extreme rates of spread are also present in areas dominated by conifer regeneration.

Supervisors with the City of Helena's Water Treatment Division, cognizant of the fire hazard in the Ten Mile Creek watershed, are actively involved with the Tri-County Fire Safe Working Group and have a keen interest in reducing the risk of a catastrophic wildfire in the Upper Ten Mile Creek watershed. Such a fire could seriously jeopardize much of Helena's drinking water supply and the associated delivery infrastructure maintained by the Water Treatment Division. The Tri-County FireSafe Working Group is very active and experienced in the development and completion of wildland fuel hazard reduction projects. Sources of funding for such projects have been the National Fire Plan (BLM, USFS), Western Wildland Urban Interface Grant Program (MT DNRC), Hazard Mitigation Grant program (DES), and PROJECT IMPACT (FEMA).

The RCWPP states that existing wildland fuel hazards can be reduced to a moderate state on slopes less that 30% where high to severe fuel hazards are present. Group C fuel types usually require some form of commercial timber harvest to mitigate the wildfire hazard (due to presence of large trees) while Group X fuels (primarily conifer regeneration) may require forest treatments that include removal and disposal of non-merchantable sized trees to reduce the wildfire hazard.

Northwest Management, Inc. (NMI) natural resources consulting firm located in Helena, MT, has been retained by the City of Helena to assess the several forested parcels owned by the City of Helena in the Ten Mile Creek watershed. NMI completed a forest inventory in the summer of 2007 to obtain the field data necessary to describe the current condition of the forested parcels in regards to existing wildfire hazard and forest health issues. The forest inventory provides data regarding tree species composition, tree ages, insect and disease information, number of trees per acre by various size classes, and merchantable timber volume estimates. Forest inventory information was utilized by NMI to provide a basis for forest management recommendations.

The forest management recommendations in this report are provided to guide City of Helena managers as they address forest health and wildland fuel hazards management issues in the Upper Tenmile Creek watershed over the next decade. *It is important to note that Helena National Forest lands border, and in most cases surround, the City of Helena lands which are the focus of this assessment. A dedicated, coordinated and cooperative effort with the Helena National Forest will be required to adequately address many of the wildfire hazard and forest*

*health issues described in this report.* The long term effectiveness of prescribed forest management treatments will be enhanced if efforts between the Helena National Forest and City of Helena can be coordinated to address shared forest management issues.

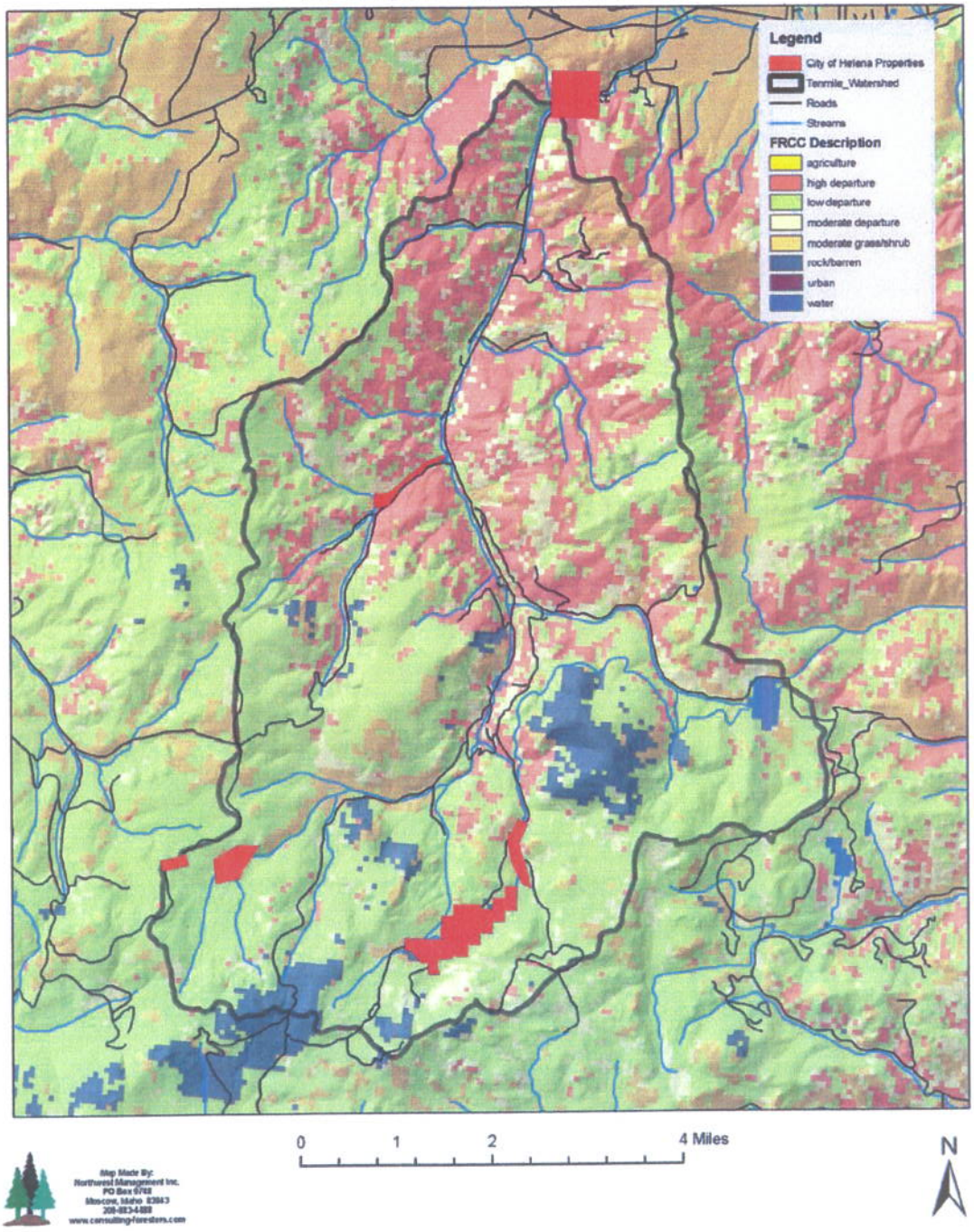
## Fire Regime Condition Class and Historic Fire Regime

Historical timber harvest, livestock grazing, and fire suppression have dramatically changed vegetation conditions throughout the Northern Rockies. Fire-regime condition class (FRCC) is an approximation of ecosystem departure resulting from a change in fire regimes. The greater the departure, the greater the probability that the status of some ecosystem component will decline if a fire occurs. Severe fire effects are those that are considered to be outside those effects characteristic of the historical range. The US Forest Service, who developed this data, used three condition classes to qualitatively rate the departure from historical fire regimes. If a comparison of the historical fire regime and current fire severity changed by at least one class, then they would conclude that the condition class has a value that exceeds Class 1. The greater the departure, the greater the probability that key ecosystem components would be lost if a wildfire occurred. Condition Class 1 occurs if there is no detectable change in fire severity between the historical fire regime and current fire severity.

The maps on the following 2 pages illustrate the Fire Regime Condition Class and Historic Fire Regime for the City of Helena ownership in the Upper Tenmile Creek Drainage.

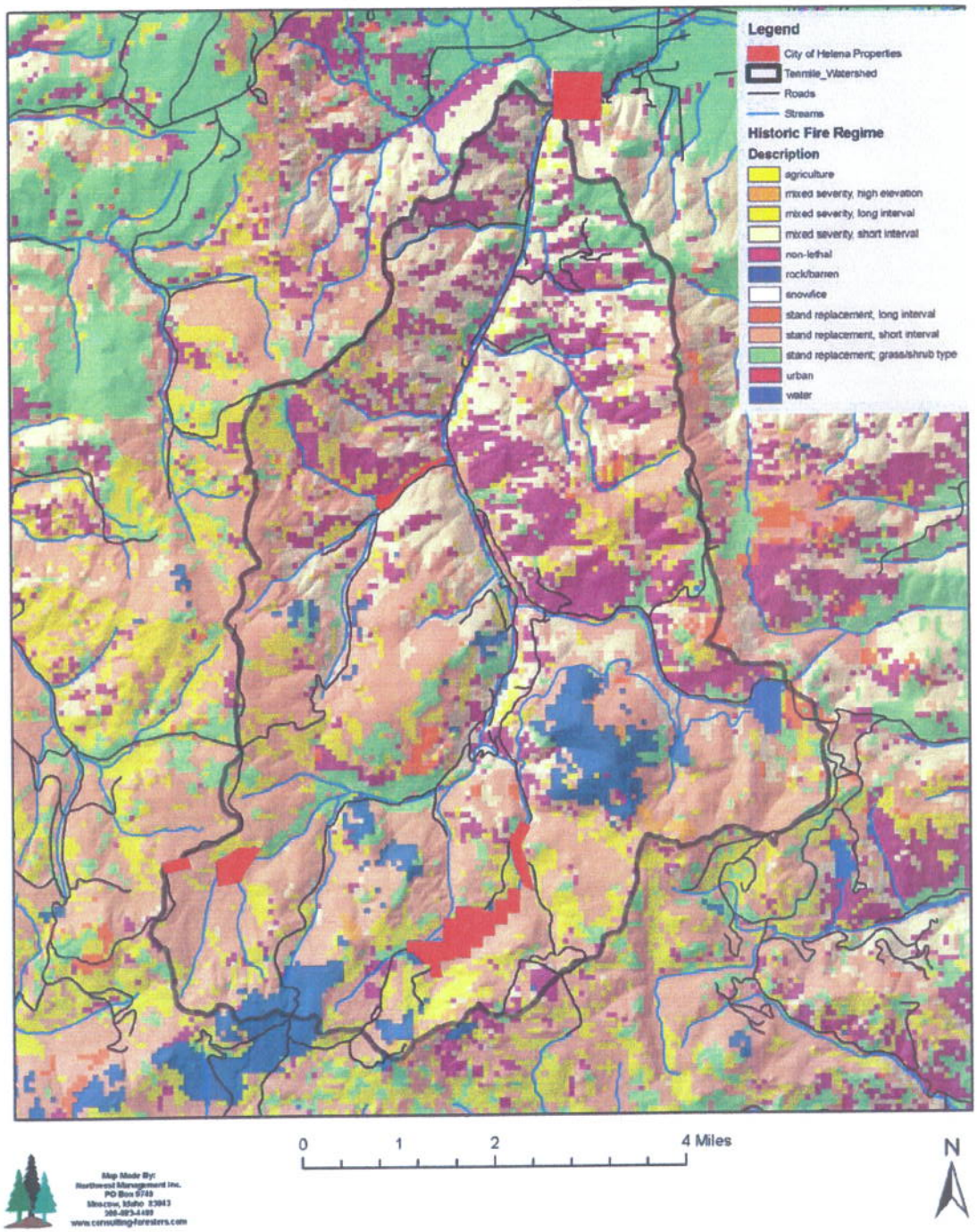
City of Helena
Upper Tenmile Creek Drainage

Fire Regime Condition Class



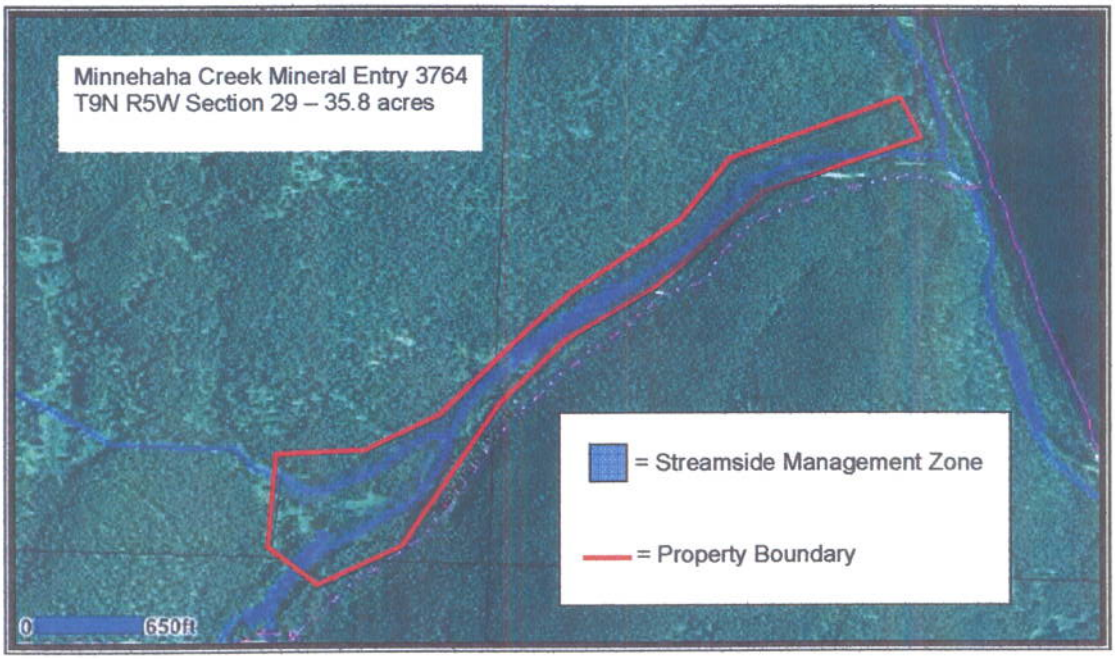
City of Helena
Upper Tenmile Creek Drainage

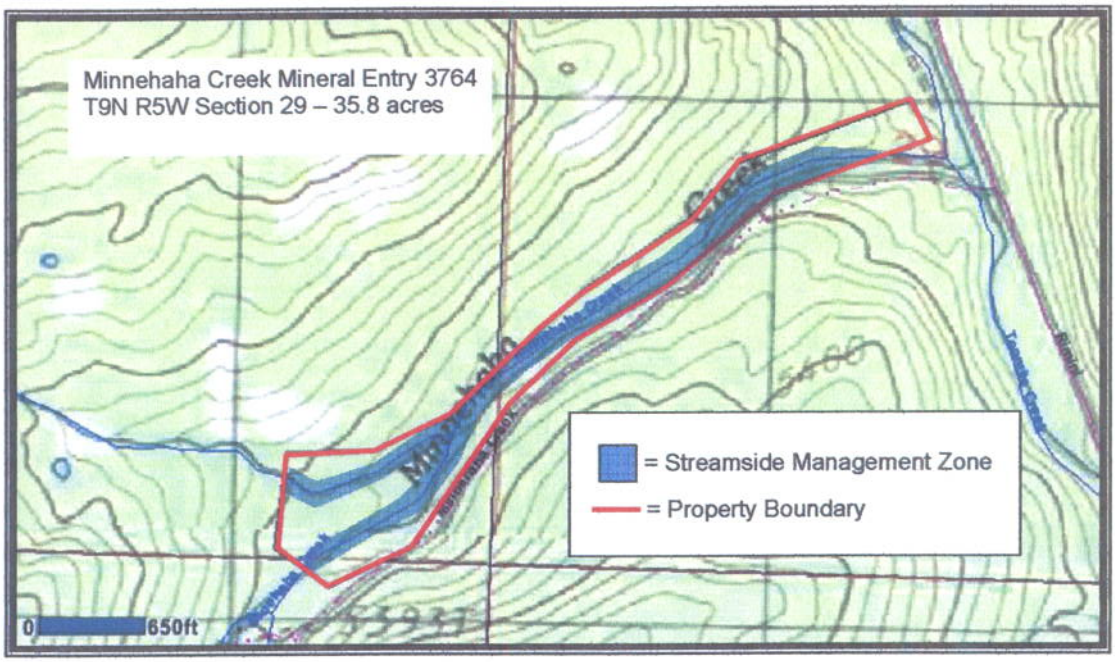
Historic Fire Regime



# Forest Inventory Results and Management Recommendations

***Location 1: Minnehaha Creek***



**Location/Access**

The Minnehaha Creek parcel contains a total of approximately 36 acres and is located near the intersection of Rimini Road (#625) and Minnehaha Creek Road (#527). The parcel is completely surrounded by Helena National Forest lands. Property corners are well monumented in most locations. The Minnehaha Creek Road parallels much of the southern property boundary and provides access to the southwest corner of the property. Access to the north boundary of the property is available by utilizing a narrow primitive road located on the Helena National Forest. Commercial use of the road would require a road use agreement with the Helena National Forest. The road would require widening and grading to provide access for highway vehicles. Off road logging equipment could potentially utilize the road for log skidding purposes in its current condition.

Minnehaha Creek flows through the central portion of the property and Whiskey Creek flows through the western portion of the property. The property averages less than 250 feet in width along much of its length. The Minnehaha Creek head gate is located near the north east property corner. The tract receives a high degree of recreational use due to the proximity of Minnehaha Creek Road. Recreational uses include camping, picnicking, day hiking and hunting access.

**Stand Description**

The Minnehaha property is predominately forested with sawlog-sized lodgepole pine, Douglas-fir and aspen. Lodgepole pine tends to be in poor to fair biologic condition primarily due to advanced age, infestation from mountain pine beetle and overcrowding. Douglas fir is good condition. Aspen is in fair to good condition. Wildfire risk is rated as high due to dense stands of mature conifers.

Stream banks adjacent to the Minnehaha Creek stream channel are very steep in most locations. As a result erosion potential is high adjacent to the stream channel due to steep slope gradients. If timber harvesting activities were to occur on the property the Streamside Management Zone boundary would extend 100 feet to either side of the stream where slopes exceed 35%. Wheeled or tracked timber harvesting equipment would be restricted from operating within the SMZ. Whiskey Creek enters Minnehaha Creek on the west end of the tract. Riparian and wetland areas associated the streams in this area would require a significant degree of protection if harvesting activities were to occur. A stream channel crossing would need to be developed for equipment or vehicles to cross either stream channel on the west end of the parcel.

Approximately 19 forested acres were inventoried to provide timber volume estimates. This acreage has moderate topography which could be reasonably accessed for the purposes of conduct forest stand improvement projects related to wildfire hazard reduction and forest health improvement.

**Forest Inventory Results**

Stand 1- Minnehaha Creek

Total net merchantable sawlog volume in Stand 1 is estimated at 13.1 thousand board feet (MBF) per acre. Total gross net volume is estimated at 249 MBF. 73% of the merchantable volume is lodgepole pine, 25% Douglas-fir and the remaining 2% is ponderosa pine. Mountain

pine beetle infestation is present in sawlog-sized lodgepole pine currently represents a minor percentage of the total merchantable volume in the stand. Douglas fir regeneration is relatively abundant in the stand. Lodgepole pine regeneration is relatively sparse. The stand has an average of 544 trees per acre and the average basal area is 117 square feet per acre. The average age of sawlog-sized trees is 96 years.

**Recommended Treatment**

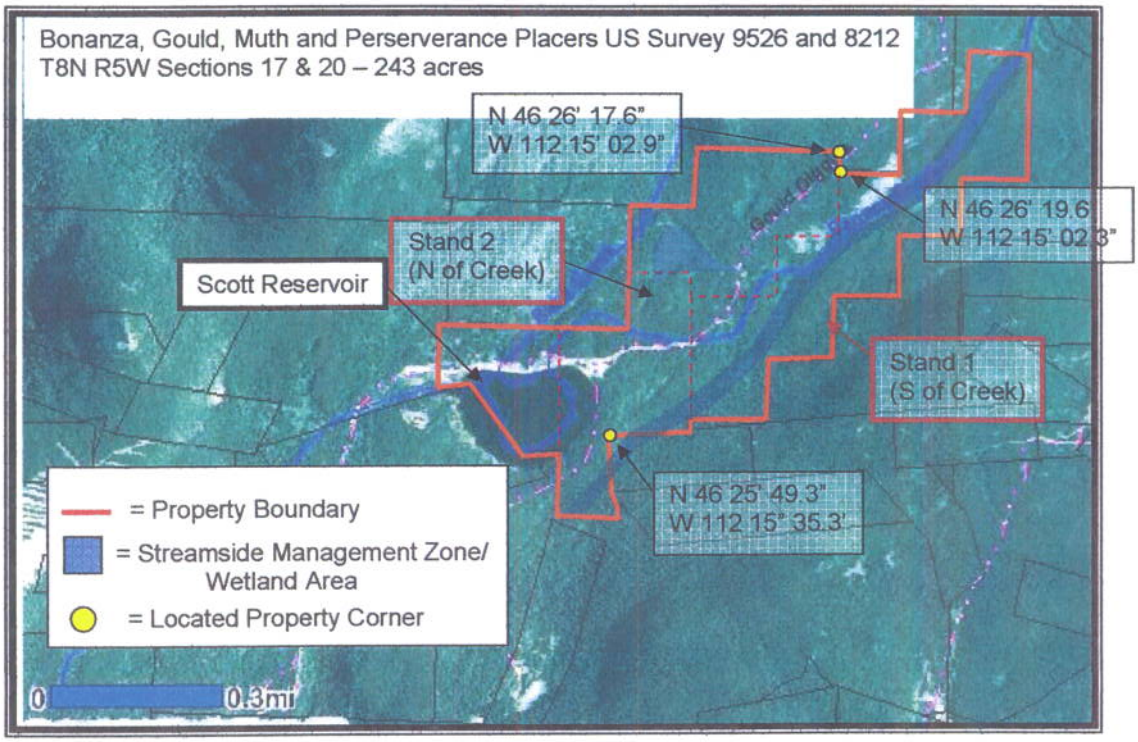
Wildfire hazard mitigation projects on adjacent National Forest lands would be required to significantly reduce the potential for a catastrophic crown fire due to the narrow width of the property. A stream crossing would need to be developed on the west end of the property to access forested areas north of Minnehaha Creek.

Recommended forest treatment would include salvage of merchantable lodgepole pine which is beetle infested and selective harvesting of lodgepole pine or in poor to fair biologic condition. This treatment would reduce potential safety hazards associated with unstable dead and dying trees near recreational use areas and reduce potential fuel buildup associated with accumulation of dead and down woody material. Only a small percentage of the property is currently accessible to ground based logging equipment. Timber harvesting could be economically feasible if completed in conjunction with a project on nearby lands. As a stand alone project, treatment costs would likely exceed income from the sale of wood products such as sawlogs and pulpwood. Logging costs would be high due to minimal potential harvest volume, restricted access, and potential costs associated with developing a stream crossing and road use agreements. Forest management emphasis on this parcel would include fuel reduction in the vicinity of the Minnehaha head gate and removal of dead and insect infested merchantable trees on the remainder of the property where existing access points can be utilized.

***Location 2: Scott Reservoir Area***

**Location/Access**

The Bonanza, Gould, Muth Placer and Perseverance Placer make up the Scott Reservoir Area. These properties adjoin each other and are located near the Banner Creek Road (#1876) which provides access to the central portion of the property. Scott Reservoir is located on the west end of the tract. An effluent valve and overflow pipe are located on the property near the west embankment of Scott Reservoir. The parcels are surrounded by Helena National Forest lands except for a portion of the southwest boundary. Property corners were located at several locations but most property corners are not well monumented and would require surveying work in order to be relocated. Banner Creek flows through the central portion of the property and Ruby Creek flows through the northwestern portion of the property. Most areas north of Banner Creek are currently accessible to logging machinery from Banner Creek Road. There is no existing road access south of Banner Creek. Road access to the south of Banner Creek could be developed from an existing primitive road which accesses the Gould Creek Diggings. Development of this access across Banner Creek would require installation of a stream crossing and some new road construction. There are two abandoned log structures located just west of the Gould Diggings that may have some archeological significance. Several other log structures were observed at various locations on the property.


Bonanza, Gould, Muth and Perserverance Placers US Survey 9526 and 8212
T8N R5W Sections 17 & 20 – 243 acres
N 46 26' 17.6"
W 112 15' 02.9"
N 46 26' 19.6"
W 112 15' 02.3"
Stand 2
(N of Creek)
Scott Reservoir
Stand 1
(S of Creek)
N 46 25' 49.3"
W 112 15' 35.3'
= Property Boundary
= Streamside Management Zone/
Wetland Area
= Located Property Corner
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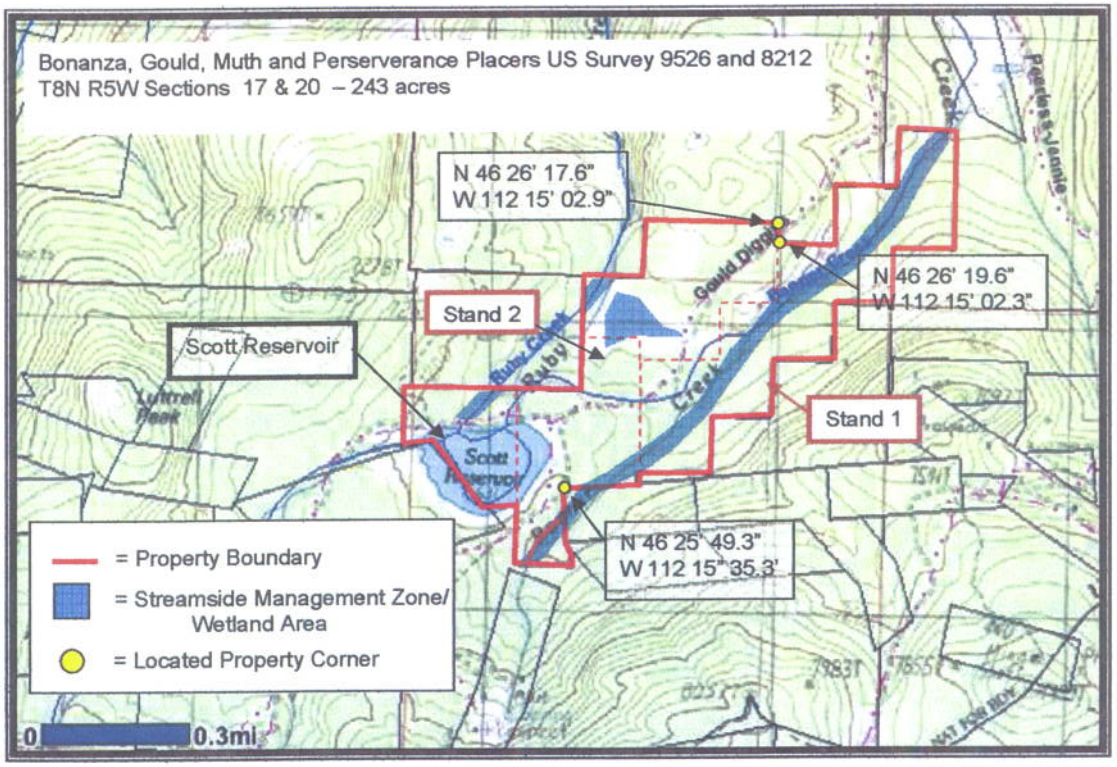
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Scott Reservoir
Stand 1
N 46 25' 49.3"
W 112 15' 35.3'
= Property Boundary
= Streamside Management Zone/
Wetland Area
= Located Property Corner
0
0.3mi

## Stand Descriptions

The Scott Reservoir Area is densely forested with sawlog and pole-sized lodgepole pine. Lodgepole pine regeneration (seedlings and saplings) are abundant in most areas. Most forest areas are overstocked and in need of commercial or pre-commercial thinning or a combination of both treatments. An active mountain pine beetle infestation is present on the property and many sawlog-sized trees have been killed in the past few years. Numerous trees have been infested during the summer of 2007. These trees are still green, but will be dead by the summer of 2008. Red needled dead trees which appear during the summer of 2008 will maintain merchantability for only another year or so. Porcupine damage was observed in the vicinity of Scott Reservoir resulting in dead and double topped trees. Wildlife sign is abundant and the area appears to receive significant use by moose, elk, deer, mountain lion, snowshoe hare, pine squirrel and grouse.

For purposes of forest inventory, the property was delineated into 2 forest stands. Stand 1 is located north of Banner Creek and includes approximately 139 forested acres. A large wet meadow is present within the central portion of the stand. Topography in Stand 1 is moderately sloped with a southeastern aspect. Rock outcroppings are present in several areas. Most of Stand 1 is accessible to logging machinery utilizing existing roads and skid trails. Many areas within the stand show evidence of previous timber harvesting activity. Wildfire fuel hazard is rated as high to severe due to presence of dense stands of mature conifers and dense stands of sapling and pole-sized trees.

Stand 2 is located south of Banner Creek and includes approximately 63 forested acres. There is no current road access to this area. Stand 2 has moderately steep topography and a northwest aspect. Sawlog sized lodgepole pine and Engelmann spruce are present in the forest overstory. Engelmann spruce and sub-alpine fir regeneration is abundant in the forest understory. Dead down wood is relatively abundant. Fuel loads are relatively high in the stand as a result. Wildfire fuel hazard is rated as high to severe due abundance of tree regeneration, abundance of downed dead woody material and presence of dense stands of mature conifers.

## Forest Inventory Results

### Stand 1-Scott Reservoir Area

Total net merchantable sawlog volume in Stand 1 is estimated at 4.4 thousand board feet (MBF) per acre. Total gross net volume is estimated at 606 MBF. Ninety nine percent of the merchantable volume is lodgepole pine, with sub-alpine fir and Engelmann spruce comprising the remaining 1%. Mountain pine beetle infestation is present in sawlog-sized lodgepole pine currently represents a minor percentage of the total merchantable volume in the stand. Sapling and pole-sized lodgepole pine are relatively abundant in the stand. Sub-alpine fir regeneration including seedlings, saplings and poles are abundant. Engelmann spruce seedlings and saplings are present but not abundant. The stand has an average of 1,681 trees per acre and the average basal area is 142 square feet per acre. The average age of sawlog-sized trees is 176 years.

Stand 2-Scott Reservoir Area

Total net merchantable sawlog volume in Stand 2 is estimated at 6.9 thousand board feet (MBF) per acre. Total gross net volume is estimated at 285 MBF. Sixty five percent of the merchantable volume is lodgepole pine, with 20% sub-alpine fir and 15% Engelmann spruce. Mountain pine beetle infestation is present in sawlog-sized lodgepole pine and currently represents a minor percentage of the total merchantable volume in the stand. Seedling, sapling and pole-sized lodgepole pine are relatively abundant in the stand. Sub-alpine fir regeneration including seedlings, saplings and poles is abundant. Engelmann spruce seedlings and saplings are present but not abundant. The stand has an average of 1,751 trees per acre and the average basal area is 131 square feet per acre. The average age of sawlog-sized trees is 188 years.

**Recommended Forest Treatment**

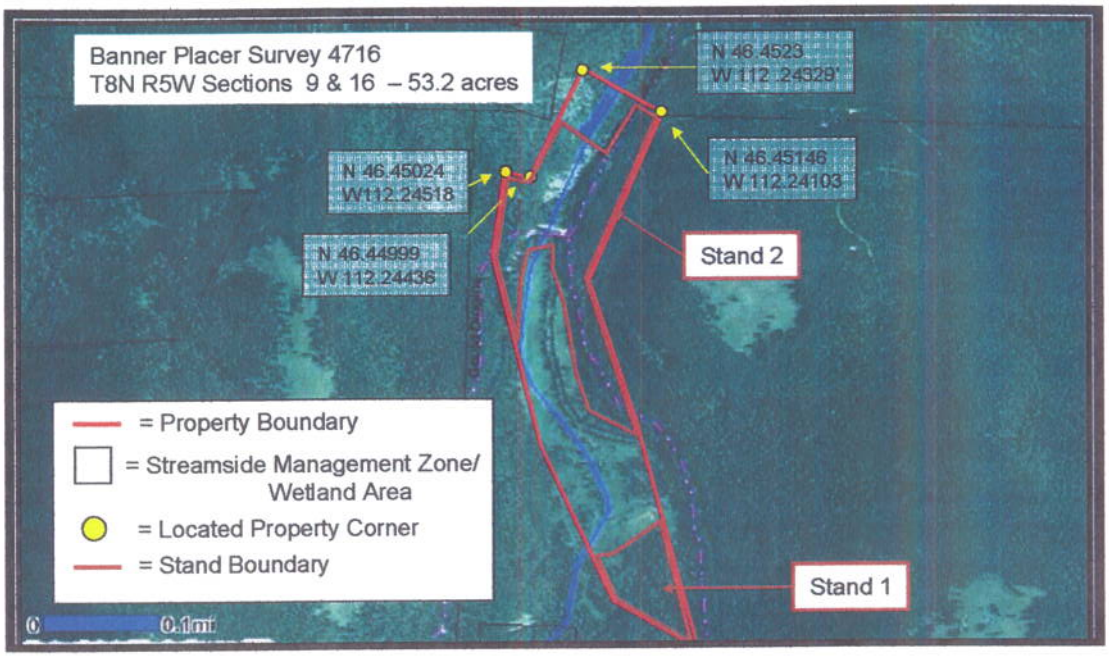
Wildfire hazard mitigation projects in both Stands 1 and 2 could significantly reduce the potential for a catastrophic crown fire. Recommended forest treatments would include selective harvesting of pole and sawlog-sized lodgepole pine in poor to fair condition and salvage harvesting of trees which have been recently attacked by mountain pine beetle on all accessible areas. Timber harvesting is economically feasible on the parcel due to the size of the tract and the volume of merchantable material present. Income generated from the harvest of merchantable material could be utilized to pre-commercially thin smaller non-merchantable seedling, sapling and pole-sized trees on the property. Revenue from the sale of sawlogs and post and poles could potentially generate net income to the City of Helena on this parcel. Forest management emphasis on this parcel would include fuel hazard reduction in the vicinity of the Banner Creek Road and removal of dead and insect infested merchantable trees on the remainder of the property where existing access points can be utilized.

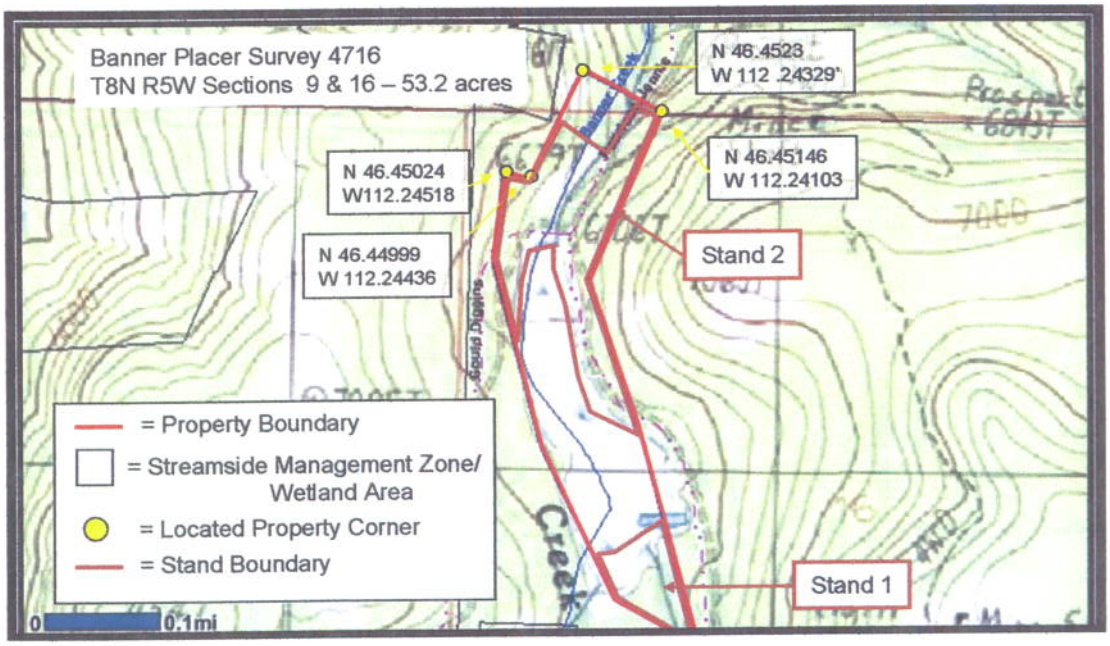
***Location 3: Banner Creek***

**Location/Access**

The Banner Placer property is located near the intersection of Banner Creek Road (#1876) and Rimini Road (#695). Banner Creek Road provides access to the northwestern corner of the property. Rimini Road provides access to the northeastern portion of the property. The Banner Placer is completely surrounded by Helena National Forest land. Property corners were located at several locations but most property corners are not well monumented and would require surveying work in order to be relocated.

Banner Creek flows through the central portion of the property. A large wet meadow, associated with Banner Creek, dominates the central portion of the property. There are several abandoned log structures located just northwest of the Banner Creek Road crossing that likely have some archeological significance. Wildlife sign is abundant and the area appears to receive significant use by moose, elk, deer, mountain lion, snowshoe hare, pine squirrel and grouse.




**Stand Description**

Stand 1 includes approximately 19 forested acres suitable for treatment. An active mountain pine beetle infestation is present and many sawlog-sized trees in the stand have been killed in the past couple years. Numerous additional trees have been infested during the summer of 2007. These trees are still green but will be dead by the summer of 2008. Red needled dead trees which appear during the summer of 2008 will remain merchantable for only another year

or so. Wildfire fuel hazard is rated as high due to the presence of dense stands of mature conifers.

**Forest Inventory Results**

Stand 1-Banner Creek

Total net merchantable sawlog volume in Stand 2 is estimated at 15.1 thousand board feet (MBF) per acre. Total gross net volume is estimated at 60 MBF. Sixty two percent of the merchantable volume is lodgepole pine, 35% sub-alpine fir with Engelmann spruce comprising the remaining 3%. Mountain pine beetle infestation is present in sawlog-sized lodgepole pine and currently represents a minor but increasing percentage of the total merchantable volume in the stand. Sapling and pole-sized lodgepole pine are overly abundant in the stand and exceed 2,000 stems per acre. Sub-alpine fir regeneration including seedlings and saplings are present and moderately abundant. Engelmann spruce seedlings and saplings are present but not abundant. The stand has an average of 2,617 trees per acre and the average basal area is 232 square feet per acre. The average age of sawlog-sized trees is approximately 100 years.

Stand 2-Banner Creek

Total net merchantable sawlog volume in Stand 1 is estimated at 6.0 thousand board feet (MBF) per acre. Total gross net volume is estimated at 115 MBF. 93% of the merchantable volume is lodgepole pine, with sub-alpine fir and Engelmann spruce comprising the remaining 7%. Mountain pine beetle infestation is present in sawlog-sized lodgepole pine represents 20% of the total merchantable lodgepole volume in the stand. Seedling, sapling and pole-sized lodgepole pine are relatively abundant in the stand. Sub-alpine fir regeneration including seedlings and saplings are present but not abundant. Engelmann spruce seedlings and saplings are present but not abundant. The stand has an average of 1,205 trees per acre and the average basal area is 130 square feet per acre. The average age of sawlog-sized trees is 110 years.

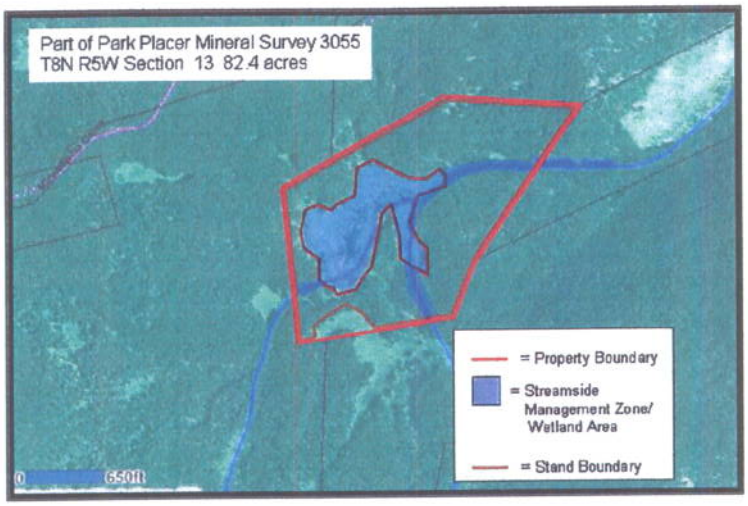
**Recommended Forest Treatment**

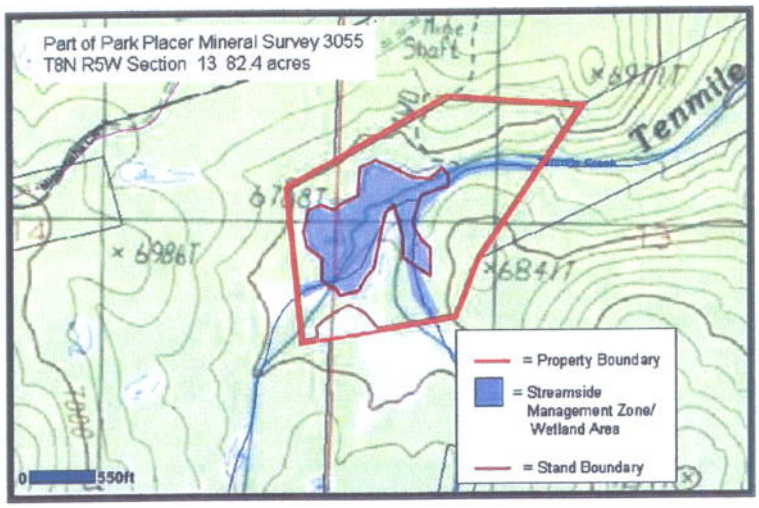
There is no existing road access to Stand 1 located on the south end of the Banner Creek property. Stand 1 does contain sawlog-sized lodgepole pine and Engelmann spruce timber; however, it also has several stream channels and wetland areas that would limit the feasibility of a timber harvest. Development of this access would require installation of stream crossings and new road construction. Wet soils in the area would be vulnerable to rutting during much of the year. Lodgepole pine and Engelmann spruce regeneration is abundant in most areas. No treatment is recommended for Stand 1 due to access issues and environmental constraints.

Forested areas in Stand 2 are currently accessible to logging machinery from existing roads. The extreme northwest corner of the property is steep with rocky outcrops making most forest treatments unfeasible. Stand 2 is densely forested with sawlog and pole-sized lodgepole pine. Tree regeneration (seedlings and saplings) are moderately abundant. An active mountain pine beetle infestation is present on the property and many sawlog-sized trees have been killed in the past couple years. Trees attacked this summer are still green but will turn red by the summer of 2008. These trees will maintain their merchantability for no longer than another year or so. If commercial timber harvesting were to occur on the property, no wheeled or tracked equipment could be operated within the Streamside Management Zone.

A wildfire hazard mitigation project which includes merchantable timber harvesting in Stand 2 would significantly reduce the potential for a catastrophic crown fire. Recommended forest treatment would include salvage harvesting of mountain pine beetle infested trees and selective harvesting of merchantable-sized lodgepole pine in poor to fair biologic condition. Areas dominated by sapling and pole-sized lodgepole pine can also be thinned. The sale of post and pole material would generate income to offset cost of removing pole and sapling-sized material. Timber harvesting is economically feasible on the parcel due to the size of the tract and the amount of merchantable material available. Income generated from the harvest of merchantable material could offset costs associated with thinning smaller non-merchantable trees on the property. Revenue from the sale of sawlogs and post and poles could potentially generate net income to the City of Helena on this parcel. Forest management emphasis on this parcel would include fuel hazard reduction in the vicinity of the Banner Creek Road and Rimini Road within Stand 2.

***Location 4: Tenmile Creek***



### Location/Access

The Tenmile Creek property is located in the headwaters of the Tenmile Creek drainage. The property is bordered by Helena National Forest land on its east, west and south boundaries. A privately owned parcel borders the west boundary. Road access to the parcel is limited to a steep jeep trail which accesses the property from the Minnehaha Creek Road (#527) across the Helena National Forest. This road is not suitable for highway vehicles and its steep grade would prohibit commercial log truck traffic. Road access could potentially be developed from private land located west of the parcel on Tenmile Creek. Alternatively, road access would need to be developed from the Minnehaha Creek Road across Helena National Forest land. Property corners were located at several locations, but most property corners are not well monumented and would require surveying work in order to be relocated.

Tenmile Creek flows through the central portion of the property. A large wet meadow dominates the central portion of the property. Wildlife sign is abundant and the area appears to receive significant use by moose, elk, deer, mountain lion, snowshoe hare, pine squirrel and grouse.

### Stand Description

Stand 1 of Tenmile Creek includes approximately 48 forested acres suitable for treatment. The stand consists of mostly mature sawlog-sized lodgepole pine. Tree regeneration includes scattered sapling sized lodgepole pine. Downed dead wood is not abundant, but will likely increase over the next several years due to tree mortality associated with an active mountain pine beetle infestation. A significant percentage of sawlog-sized trees in the stand have been killed in the past couple years. Numerous additional trees have been infested during the summer of 2007. These trees are still green but will be dead by the summer of 2008. Red needled dead trees which appear during the summer of 2008 will remain merchantable for only another year or two. Wildfire fuel hazard is rated as high due the presence of dense stands of mature conifers and increasing abundance of dead trees.

### Forest Inventory Results

Stand 1-Tenmile Creek

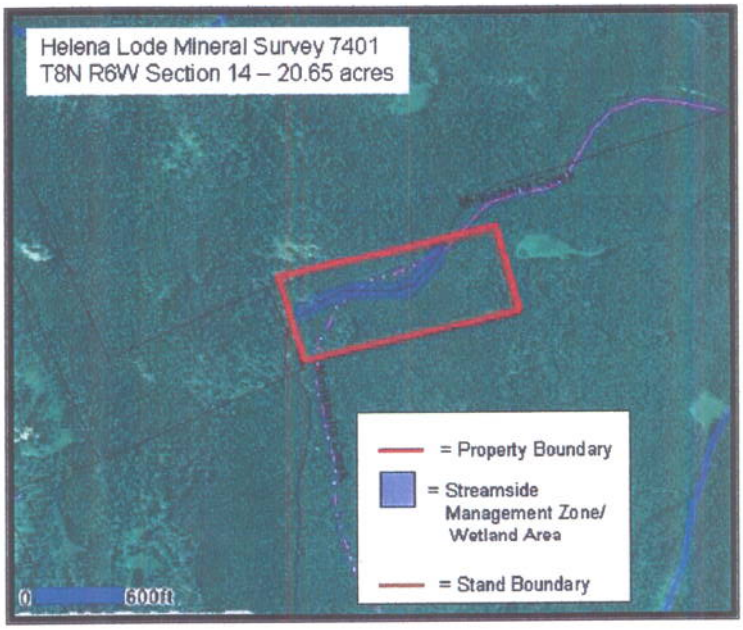
Total net merchantable sawlog volume in Stand 1 is estimated at 7.6 thousand board feet (MBF) per acre. Total gross net volume is estimated at 367 MBF. One hundred percent of the merchantable volume is lodgepole pine. Mountain pine beetle infestation is present in 47% of the sawlog-sized lodgepole pine, representing a significant percentage of the total merchantable volume in the stand. Sapling and pole-sized lodgepole pine are present, but not abundant in the stand. The stand has an average of 407 trees per acre and the average basal area is 103 square feet per acre. The average age of sawlog-sized trees is approximately 100 years.

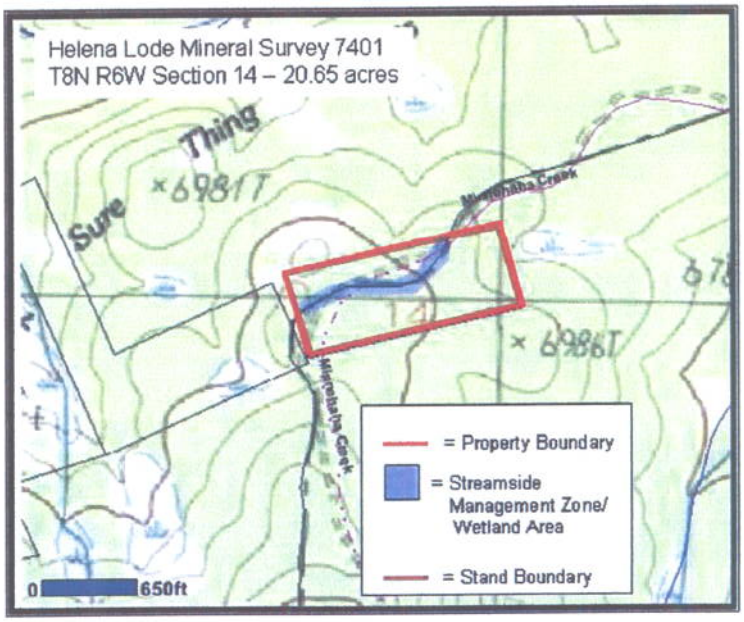
### Recommended Forest Treatment

A wildfire hazard mitigation project which includes merchantable timber harvesting would significantly reduce the potential for a catastrophic crown fire. Due to the high percentage of beetle infested trees, a salvage harvest is recommended as soon as possible. Development of road access to the parcel is required to implement the forest treatments recommended below. Recommended forest treatment would include salvage harvesting of mountain pine beetle infested trees and selective harvesting of merchantable-sized lodgepole pine in poor to fair biologic condition. Timber harvesting is economically feasible on the parcel due to the size of

the tract and the amount of merchantable material available. Costs associated with development of road access will be a primary determinant of whether or not the stand can be treated on a below cost basis. Income generated from the harvest of merchantable material could offset road development costs. Revenue from the sale of sawlogs could potentially generate net income to the City of Helena on this parcel. Forest management emphasis on this parcel would include fuel hazard reduction within all forested areas.

***Location 5: Helena Lode***



### Location/Access

The Helena Lode property is located on the Continental Divide and straddles the headwaters of the Tenmile Creek drainage. The property is bordered by Helena National Forest land on all of its boundaries. A privately owned parcel is located close to the west boundary. The Minnehaha Creek Road (#527) passes through the central portion of the property. This road is suitable for use by highway vehicles and commercial log truck traffic though the road surface is currently in poor condition. Property corners were observed at several locations and appear to be well established. The area appears to receive use by moose, elk, deer, mountain lion, snowshoe hare, pine squirrel and grouse.

### Stand Description

The property was evaluated as a single stand and includes approximately 20 forested acres suitable for treatment. The stand consists of mostly mature pole-sized lodgepole pine. Mature lodgepole pine is present, but is highly defective and has little merchantable value. Tree regeneration includes scattered sapling sized Engelmann spruce and sub-alpine fir. The forest understory has little down woody material. A significant percentage of sawlog-sized trees in the stand have been killed in the past couple years by mountain pine beetle. Numerous additional trees have been infested during the summer of 2007. These trees are still green but will be dead by the summer of 2008. Red needled dead trees which appear during the summer of 2008 will remain merchantable for only another year or two. Wildfire fuel hazard is rated as moderate to high due the presence of dense stands of mature conifers and increasing abundance of dead trees.

### Forest Inventory Results

Stand 1-Helena Lode

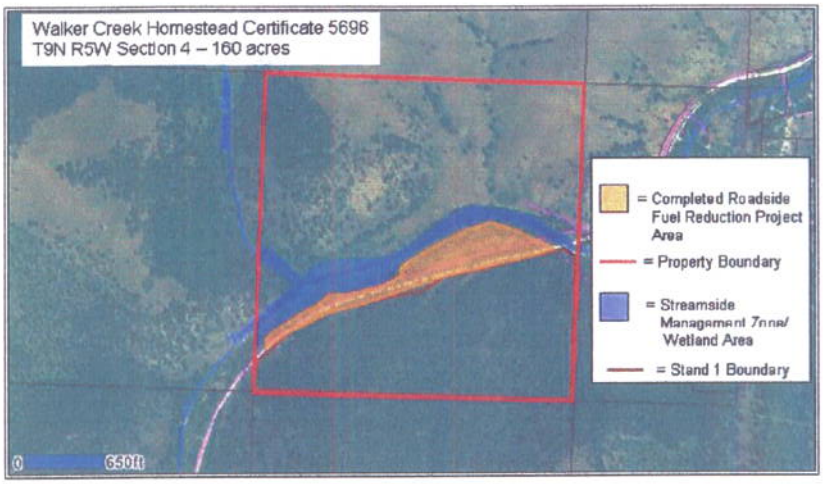
Total net merchantable sawlog volume in Stand 1 is estimated at 5.6 thousand board feet (MBF) per acre. Total gross net volume is estimated at 112 MBF. Ninety five percent of the merchantable volume is lodgepole pine with Engelmann spruce comprising the remaining 5%. Mountain pine beetle infestation is present in 18% of the sawlog-sized lodgepole pine which represents a significant percentage of the total merchantable volume in the stand. Sapling and pole-sized lodgepole pine are abundant in the stand. Sub-alpine fir and Engelmann spruce regeneration including seedlings, saplings and poles is present but not abundant. The stand has an average of 462 trees per acre and the average basal area is 91 square feet per acre. The average age of sawlog-sized trees is approximately 100 years.

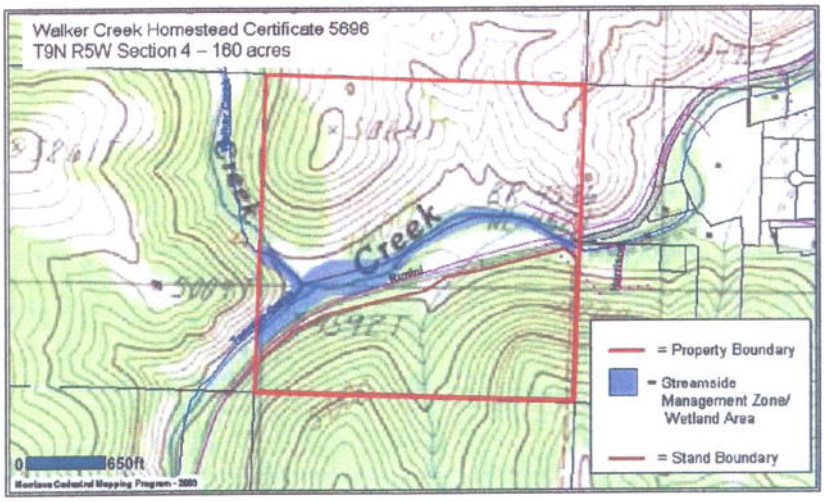
### Recommended Forest Treatment

A wildfire hazard mitigation project which includes both pre-commercial thinning and merchantable timber harvesting could be done to significantly reduce the potential for a catastrophic crown fire. Recommended forest treatment would include salvage harvesting of sawlog-sized mountain pine beetle infested trees and selective harvesting of merchantable-sized lodgepole pine in poor to fair biologic condition. Pole-sized trees in poor to fair biologic conditions can be commercially harvested and marketed as posts and pole material. Timber harvesting is economically feasible on the parcel due to the size of the tract and the amount of merchantable material available. Revenue generated from the sale of sawlogs and post and pole material would likely generate enough income to offset treatment costs. Most likely the

treatment could be implemented on a "break even" basis. Forest management emphasis on this parcel would include fuel hazard reduction within all forested areas.

### *Location 6: Walker Creek*



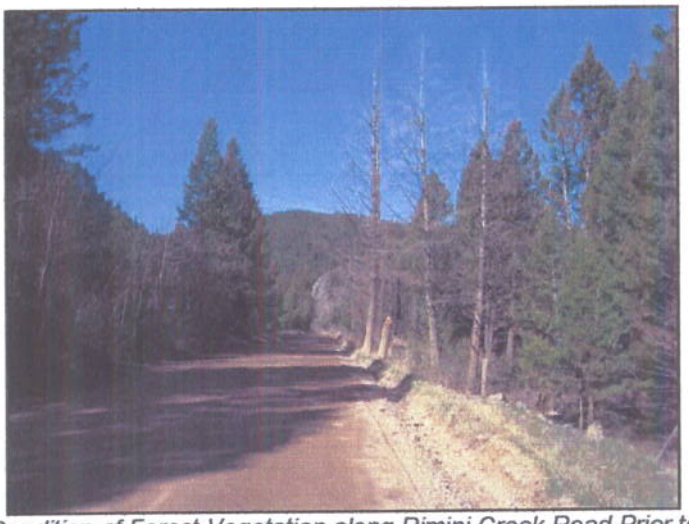




### Location/Access

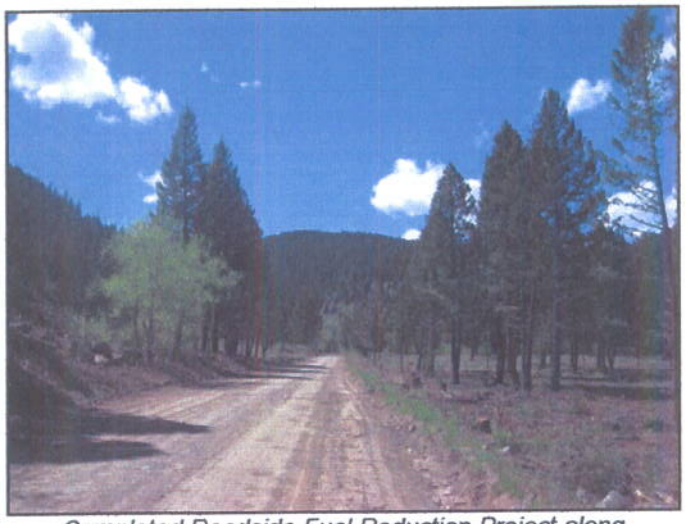
The Walker Creek property is located in the lower portion of the Tenmile Creek drainage and is accessed by the Rimini Creek Road (#695) which passes through the central portion of the property. Tenmile Creek also flows through the central portion of the property paralleling the Rimini Creek Road. The property is bordered by BLM property on its south boundary and private lands on the remainder of its boundaries. The parcel is very steeply sloped on either side of Tenmile Creek and road access is limited to the valley floor.

**Stand Description**

The area lying north of Tenmile Creek is predominately steeply sloped rangeland with some inaccessible pockets of forest vegetation. This area was excluded from forest inventory due to its inaccessibility and low potential for forest treatment. The riparian area associated with Rimini Creek and adjacent to portions of the Rimini Road is vegetated with Douglas-fir, ponderosa pine, black cottonwood, aspen and Rocky Mountain juniper. A fuel reduction treatment was successfully completed along either side of Rimini Road, on 9 acres, by the City of Helena during the summer of 2007. The project included thinning and disposal of dead standing trees, non-merchantable sized conifers and shrubs. As a result a fuel break has been established along the Rimini Road throughout the length of the property.



*Condition of Forest Vegetation along Rimini Creek Road Prior to Roadside Fuel Reduction Project on the Walker Creek Property*



*Completed Roadside Fuel Reduction Project along Rimini Road on the Walker Creek Property*

The forest stand located south of Tenmile Creek was inventoried and includes approximately 49 forested acres. The stand consists of mostly mature Douglas-fir with some ponderosa pine. Topography is moderate to steep sloped with slope percentages ranging from 35-65%. Rocky outcrops are common. Douglas-fir on upper slopes are very poor quality and highly defective due to large branches, dead tops and deformed trunks. Tree regeneration includes mostly poor quality suppressed Douglas-fir seedlings and saplings. An active western spruce budworm infestation has resulted in defoliation of new growth on Douglas-fir trees over the past several years. Wildfire fuel hazard is rated as high due to the presence of dense stands of mature conifers on steep topography.

**Forest Inventory Results**

Stand 1-Walker Creek

Total net merchantable sawlog volume in Stand 1 is estimated at 6.9 thousand board feet (MBF) per acre. Total gross net volume is estimated at 340 MBF. Ninety six percent of the merchantable volume is Douglas-fir, with ponderosa pine comprising the remaining 4%. Sapling and pole-sized Douglas-fir are relatively abundant in the stand. Ponderosa pine regeneration including seedlings, saplings and poles is mostly absent. The stand has an average of 517 trees per acre and the average basal area is 134 square feet per acre. The average age of sawlog-sized trees exceeds 100 years.

**Recommended Forest Treatment**

The potential for forest treatment is low due to steep topography, lack of road access and the poor quality of merchantable timber. Commercial harvesting would likely require the use of a helicopter which would be cost prohibitive due the small area and low stocking of merchantable timber.

## Recommended "Next Step" for the City of Helena

Northwest Management, Inc. recommends that the City of Helena coordinate with the Tri-County Fire Safe Working group and Helena National Forest staff to review the forest treatment recommendations contained in this report. NMI staff is available to present their findings at the request of the City of Helena. Several forest treatment recommendations in this report should be implemented within the next year or two in order to salvage merchantable timber volume associated with dead and dying mountain pine beetle infested trees. Road access issues on National Forest Lands will likely require Environmental Assessments which are likely to take at least one calendar year to complete. Economic feasibility of recommended treatments will be enhanced if recommended treatments can be combined into as few contracts as possible and scheduled to occur in the same operating season.

The combined effects of past fire suppression, heavy fuel loads, an extended drought period and an active mountain pine beetle infestation have put forests on the City of Helena lands, as well as adjoining National Forest and private lands in the Tenmile Creek drainage, at significant risk of a catastrophic wildfire. The combined effects of a large scale forest fire in the Upper Tenmile Creek drainage could potentially threaten a major source of Helena municipal water supply. If such a fire were to occur, infrastructure associated with the City of Helena water delivery system and residences in the Upper Tenmile drainage would be threatened with

destruction. Impacts to the Upper Tenmile Creek watershed would also likely include a significantly increased potential for soil erosion, decrease in water quality due to sedimentation and a loss of forested wildlife habitat. The forest treatment recommendations provided in this report are only a first step toward addressing the significant forest health and wildfire hazard issue in this watershed.

# Appendix

Forest Inventory Data Reports